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(71) Applicant: **WMS GAMING, INC.**
Chicago, Illinois 60618 (US)

(72) Inventors:
- **Thomas, Alfred**
  Chicago, IL 60611 (US)
- **Gomez, Benjamin T.**
  Chicago, Illinois 60657 (US)

(74) Representative: **Loisel, Bertrand**
Cabinet Plasseraud,
84, rue d'Amsterdam
75440 Paris Cédex 09 (FR)

(54) Slot machine with collection-based award feature

(57) A collection-based award system for a slot machine operable in a bonus round. The bonus round consists of a fixed number of spins of the reels of the slot machine. The outcome of each spin in the bonus round is represented by the display of a symbol group including various collection symbols and standard symbols. Each symbol group in the bonus round is evaluated for the presence of collection symbols and for the presence of standard symbols defining a standard winning combinations. Following the bonus round, a payoff is made to the player corresponding to the cumulative value of the collection symbols and standard winning combinations.

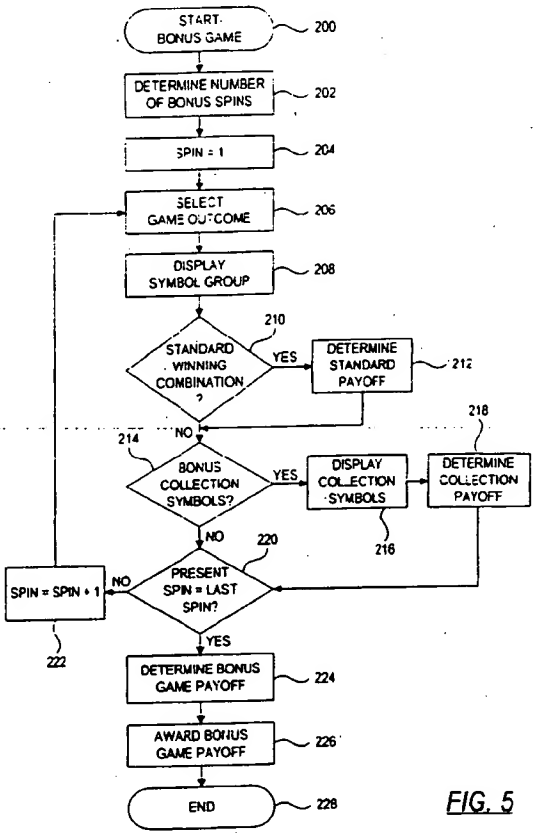

FIG. 5

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FIELD OF THE INVENTION

[0001] The present invention relates generally to gaming machines and, more particularly, to a bonus game for a gaming machine.

BACKGROUND OF THE INVENTION

[0002] Gaming machines, such as slot machines, video poker machines and the like. have been a comerstone of the gaming industry for several years. Generally. the popularity of such machines with players is dependent on the likelihood (or perceived likelihood) of winning money at the machine and the intrinsic entertainment value of the machine relative to other available gaming options. Where the available gaming options include a number of competing machines and the expectation of winning each machine is roughly the same (or believed to be the same). players are most likely to be attracted to the most entertaining and exciting of the machines Shrewd operators consequently strive to employ the most entertaining and exciting machines available, because such machines attract frequent play and hence increase profitability to the operator. Accordingly, in the competitive gaming machine industry, there is a continuing need for gaming machine manufacturers to produce new types of games, or enhancements to existing games. which will attract frequent play by enhancing the entertainment value and excitement associated with the game.

[0003] One concept which has been successfully employed to enhance the entertainment value of a game is the concept of a "secondary" or "bonus" game which may be played in conjunction with a "basic" game. The bonus game may comprise any type of game. either similar to or completely different from the basic game, which is entered upon the occurrence of a selected event or outcome of the basic game. The bonus game concept is the subject of EP-A-0 874 337, which discloses an embodiment wherein the basic game is a reel-type slot machine and the bonus game is a simulated reel-type slot machine implemented on a dot-matrix display. The bonus game is entered upon the appearance of a special symbol combination on the reels of the slot machine in the basic game. Generally, bonus games produce a significantly higher level of player excitement than the basic game because they provide a greater expectation of winning than the basic game and are accompanied with more attractive or unusual video displays and/or audio.

[0004] Because the bonus game concept offers tremendous advantages in player appeal and excitem nt relative to other known games, and because such games are attractive to both players and operators, there is a continuing need to develop new types of bonus games to satisfy the demands of players and operators. Preferably, such new bonus games will maintain, or even further enhance, the level of player excitement offered by bonus games heretofore known in the art. The present invention is directed to satisfying these needs.

SUMMARY OF THE INVENTION

[0005] In accordance with one aspect of the present invention, there is provided a slot machine for playing a game of chance having a collection-based award system. The slot machine is operable in a bonus round consisting of a fixed number of spins. The outcome of each spin is randomly selected under processor control. A display means is provided for displaying a number of symbol groups representing the outcome of the spins. The symbol groups include various collection symbols and standard symbols. A symbol group evaluation means associated with the processor both identifies the number(s) of collection symbols displayed in the bonus round and determines whether any combinations of standard symbols defining a standard winning combinations occurs in the bonus round. A valuation means associated with the processor determines collection payoff values of the collection symbols displayed in the bonus round and determines standard payoff values of any standard winning combinations occurring in the bonus round. A summation means associated with the processor adds the collection payoff values and standard payoff values to define a bonus round payoff value, and a payoff means associated with the processor awards the bonus round payoff value to a player.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The foregoing and other advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

FIG. 1a is a simplified illustration of a spinning reel slot machine with dot matrix display on which the present invention may be implemented;

FIG. 1b is a block diagram of a control system for the slot machine of FIG. 1a;

FIG. 2 is an illustration of three reel strips which may be placed on the reels of the slot machine of FIG. 1 to implement the present invention;

FIG. 3a through 3c is a table identifying various symbol combinations which may occur in a basic game or bonus game using the reel strips of FIG. 2 according to one embodiment of the present invention;

FIG. 4 is a table summarizing payoffs, probabilities and expected values associated with the occurrence of the combinations identified in FIG. 3 in a basic game according to one embodim nt of the present invention;

FIG. 5 is a flow diagram identifying various steps in

implementation of a bonus game with a collection-based award feature according to one embodiment of the present inv ntion;

FIG. 6 is a table summarizing payoffs, probabilities and expected values associated with the occurrence of the standard winning combinations identified in FIG. 3 in a bonus game according to one embodiment of the present invention;

FIG. 7 is a table identifying various bonus game collection symbols which may appear in a bonus game according to one embodiment of the present invention; and

FIG. 8 is a table summarizing payoffs, probabilities and expected values associated with the occurrence of the bonus game collection symbols identified in FIG. 7 in a bonus game according to one embodiment of the present invention.

[0007] While the invention is susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and will be described in detail herein. However, it should be understood that the invention is not intended to be limited to the particular forms disclosed. Rather, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

DESCRIPTION OF SPECIFIC EMBODIMENTS

[0008] Turning now to the drawings and referring initially to FIG. 1a. there is depicted a slot machine 10 on which the present invention may be implemented. The slot machine 10 is operable in a basic mode to play a "basic" slot machine game and in a bonus mode to play a "bonus" or secondary game. The slot machine 10 includes a display window 12 through which a player may observe three spinning reels, 14, 16 and 18. The slot machine further includes a video display 24 for displaying various graphics associated with the basic game and/or bonus game. The video display 24 may comprise a dot matrix, CRT, LED, electro-luminescent display or generally any type of video display known in the art. In one embodiment, the basic game is implemented on the reels 14, 16, 18, whereas the bonus game is implemented both on the reels 14, 16, 18 and the video display 24. It will be appreciated, however, that the basic game and/or the bonus game may be implemented entirely in video.

[0009] FIG. 1b is a block diagram of a control system suitable for operating the slot machine 10 of FIG. 1a. Coin/credit detector 38 signals a processor 40 when a player has inserted a number of coins or played a number of credits. Then, after the player has activated a switch 42 (e.g., by pulling lever 20 or pushing a button), the processor 40 initiates basic game play by setting reels 14, 16, 18 in motion, randomly selecting a stop position of the reels 14, 16, 18 and, using technology well known in the art, causing a reel motor and step controller 44 to stop the reels 14, 16, 18 at th selected stop position. A rotational position detector 46 provides feedback to the processor 40 to ensure that the reels 14, 16, 18 are stopped at the correct stop position. The symbols displayed on the reels at the preselected stop position define the basic game outcome.

[0010] A system memory 48 stores control software, operational instructions and data associated with the slot machine 10. In one embodiment, the memory 48 comprises a separate read-only memory (ROM) and battery-backed random-access memory (RAM). However, it will be appreciated that the memory 48 may be implemented on any of several alternative types of memory structures or may be implemented on a single memory structure. A payoff mechanism 50 is operable in response to instructions from the processor 40 to award a payoff of coins or credits to the player in response to certain winning combinations stored in memory 48. As will be described in detail hereinafter, the payoff amounts corresponding to certain combinations is predetermined according to a pay table stored in system memory 48.

[0011] In the illustrated embodiment, the symbols displayed on the reels 14, 16, 18 define a symbol group consisting of nine symbols, with each symbol being displayed in either an upper, center, or lower display position on one of the reels 14, 16, 18. It will be appreciated, however, that any of several alternative symbol group configurations may be employed, for example, where the slot machine 10 has fewer or greater numbers of reels. and/or where fewer or greater numbers of symbols are visible in the display window 12.

[0012] In one embodiment, the combination of symbols which determine the basic game outcome consist of only those symbols which are aligned with center payline 22. It will be appreciated, however, that a basic game implemented on the slot machine 10 may use a variety of other payline configurations to define the basic game outcome. For example, the slot machine 10 might include an upper payline (where the combination of symbols consisting of the upper symbol on each reel comprises the game outcome), lower payline (where the combination of symbols consisting of the lower symbol on each reel comprises the game outcome), angled paylines (where the combination of symbols consisting of the lower, center and upper symbols, respectively, or upper, center and lower symbols, respectively, on the three reels comprises the game outcome) or diamondshaped paylines (where the combination of symbols consisting of the center symbol on the first and third reels and either the upper or lower symbol on the second reel comprises the game outcome).

[0013] Alternatively or additionally, another payline configuration known as a scatt r-pay configuration may be employed to define the basic game outcomes. In th scatter-pay configuration, symbol combinations defining the gam outcomes are not required to be aligned

with fixed payline(s). Rather, the symbol group is determined to include a basic winning combination if any combination of three symbols consisting of one symbol from each of the three reels 14, 16, 18 corresponds to one of the symbol combinations identified in the pay table. Thus, for example, suppose the symbol combination SYMBOL1, SYMBOL2, SYMBOL3 is a basic winning combination of a game played on the slot machine 10. In scatter-pay format, the winning combination occurs if reel 14 displays SYMBOL1 in either of the upper, center or lower display positions, reel 16 displays SYMBOL2 in either of the upper, center or lower display positions (which need not correspond to the display position of SYMBOLI on reel 14) and reel 18 similarly displays SYMBOL3 in either of the upper. center or lower display positions (which need not correspond to the display positions of SYMBOL1 or SYMBOL2 on reel 14 or 16).

[0014] In one embodiment, the symbol group displayed on reels 14, 16, 18 may indicate any of three possible basic game outcomes, including (1) a traditional winning outcome causing the processor 40 to award the player a predetermined amount of coin(s) or credit(s); (2) a start-bonus outcome causing the processor 40 to trigger play of a bonus game: and/or (3) a losing outcome causing the processor 40 to continue operation in the basic mode without awarding any coin(s) or credit (s). Hereinafter, outcomes (1) and (2) will be identified by the term "standard" winning outcomes, to distinguish them from various collection-based outcomes which may appear in the bonus game and which will be described in detail later.

[0015] Generally, each of standard winning outcomes (1) and (2) identified above are characterized by the display of one or more predefined combinations of symbols. The symbols defining the standard winning combinations are stored in a game memory. In one embodiment, the symbols defining both the traditional winning combinations and start-bonus combinations are shown in a pay table affixed to the slot machine 10 so that players may view the standard winning combinations and, in the case of traditional winning combinations, their predefined payoff amounts. The payoff amounts associated with the start-bonus combinations are generally not predefined and, accordingly, do not typically appear on the pay table, although an average payoff amount associated with the start-bonus combinations might be displayed on the pay table.

[0016] FIG. 2 shows a set of reel strips for use with a slot machine of the type shown in FIG. 1 to implement a JACKPOT STAMPEDE™ slot machine game, assigned to the assignee of the present invention. The reel strips correspond to the reels 14, 16, 18 in FIG. I and will be identified by corresponding referenc numerals 14, 16, 18. Each of the re l strips 14, 16, 18 include twenty-four symbols (including blanks) corresponding to twenty-four available re l stopping positions. The symbols include WILD, DOUBLE WILD, 3-BAR, 2-BAR, 1-BAR, ROUND UP! and "Blank" defining "standard" symbols which, if displayed in certain predefined combinations relative to payline 22, define the standard winning combinations. Also shown on the reel strips 14,16,18 are small COW symbols, including one CASH COW symbol, which are displayed on top of (and thereby share the same reel stopping position as) some of the standard symbols. In one embodiment, the COW and CASH COW symbols have no value in the basic game and do not form the basis of standard winning combinations in either the basic or bonus game but nevertheless have collection value in a bonus game, as will be described in detail later.

[0017] Specifically, the symbols which appear on reel strip 14 include, in sequence 1-BAR, Blank, ROUND UP!, Blank, 2-BAR/COW, Blank, 1-BAR, Blank, WILD, Blank, ROUND UP!, Blank, 2-BAR/COW, Blank, 3-BAR/COW, Blank, 1-BAR, Blank, ROUND UP!, Blank, 1-BAR/COW, Blank, ROUND UP! and Blank. The symbols which appear on reel strip 16 include, in sequence, 2-BAR, Blank, WILD, Blank, 2-BAR/COW, Blank, ROUND UP!/COW, Blank, DOUBLE WILD, Blank, I-BAR/CASH COW, Blank, ROUND UP!, Blank, 3-BAR/COW, Blank, 2-BAR/COW, Blank, ROUND UP!, Blank, WILD, Blank, ROUND UP! and Blank. Finally, the symbols which appear on reel strip 18 include, in sequence, 1-BAR/COW, Blank, ROUND UP!, Blank, 2-BAR/COW, Blank, 3-BAR, Blank, WILD, Blank, ROUND UP!, Blank, 2-BAR/COW, Blank, 1-BAR/COW, Blank, ROUND UP!, Blank, 1-BAR, Blank, 3-BAR/COW, Blank, ROUND UP! and Blank.

[0018] Each of the possible combinations associated with one embodiment of the JACKPOT STAMPEDE™ game are identified in the "Reel 1," "Reel 2" and "Reel 3" columns of FIGS. 3a, 3b and 3c. The combinations identified in lines 52. 54 and 76-162 represent traditional winning combinations which, if displayed in alignment with payline 22, will cause the processor 40 to credit the player a predefined amount of coins or credits corresponding to the particular combination and to the number of coins played. The combinations identified in lines 56 through 74 represent "start-bonus" combinations which, if displayed in alignment with payline 22, will cause the processor 40 to enter a bonus mode in which credits are awarded to the player in a bonus game. The amount of credits awarded to the player in the bonus game is not predetermined but rather depends on the outcome of the bonus game. The bonus game will be described in detail in relation to FIG. 5.

[0019] The "#/Reel 1," "#/Reel 2" and "#/Reel 3 columns identify, respectively, the number(s) of reel positions on reels 14, 16, 18 that will support the various standard winning combinations. The "Hits" column identifies, for ach combination of symbols, the product of the three "#/Reel" columns and represents the number (s) of tim s the winning combinations can occur r lative to a singl active payline.

[0020] A number of the combinations identified in

FIGS. 3a through 3c will hereinafter be discussed in detail. First, consider the WILD, DOUBLE WILD, WILD symbol combination (line 52). Because there is only one WILD symbol on reel 14, one DOUBLE WILD symbol on reel 16 and one WILD symbol on reel 18, the "#/Reel" values for the WILD, DOUBLE WILD, WILD symbol combination are 1, 1 and 1, respectively. Thus, the "Hits" value for the WILD, DOUBLE WILD, WILD symbol combination is 1 *(i.e.,* 1 x 1 x 1). Next, consider the WILD, WILD, WILD combination (line 54). The number of WILD symbols appearing on reels 14, 16 and 18 are 1, 2 and 1, respectively. Thus, the"Hits" value for the WILD, WILD, WILD symbol combination is 2 *(i.e.,* 1 x 1 x 1).

[0021] The start-bonus combinations which may occur in the JACKPOT STAMPEDE™ game are identified on lines 56 through 74 of FIG. 3a. Specifically, the start-bonus combinations include two ROUND UP! symbols and a DOUBLE WILD symbol (line 56), one ROUND UP! symbol, a DOUBLE WILD symbol and a WILD symbol (lines 58, 60), three ROUND UP! symbols (line 62), two ROUND UP! symbols and a WILD symbol (lines 64, 66, 68), and one ROUND UP! symbol and two WILD symbols (lines 70. 72, 74). The occurrence of any of the start-bonus combinations in alignment with payline 22 will cause the processor 40 to trigger play of a ROUND UP! bonus game, which will be described in detail in relation to FIG. 5.

[0022] Consider the three ROUND UP!/DOUBLE WILD combinations (lines 56, 58, 60). The first of the ROUND UP!/DOUBLE WILD combinations (line 56) consists of a ROUND UP! symbol on reel 1 *(i.e.,* reel 14), a DOUBLE WILD symbol on reel 2 *(i.e., reel* 16), and a ROUND UP! symbol on reel 3 *(i.e.,* reel 18). Because there are four ROUND UP! symbols on reel 14, one DOUBLE WILD symbol on reel 16 and four ROUND UP! symbols on reel 18, the "#/Reel" values for the ROUND UP!/DOUBLE WILD combination on line 56 are 4, 1 and 4, respectively. The "Hits" value for the combination on line 56 is therefore 16 (*i.e.*, 4 x 1 x 4). Similarly, for the second of the ROUND UP!/DOUBLE WILD combinations (line 58), consisting of a WILD symbol on reel 1 *(i.e.,* reel 14), a DOUBLE WILD symbol on reel 2 *(i.e.,* reel 16), and a ROUND UP! symbol on reel 3 *(i.e.,* reel 18), the "#/Reel" values are 1, 1 and 4, respectively, because there is one WILD symbol on reel 14, one DOUBLE WILD symbol on reel 16 and four ROUND UP! symbols on reel 18. The "Hits" value for the combination on line 58 is therefore 4 *(i.e.,* 1 x 1 x 4). Next, for the third of the ROUND UP!/DOUBLE WILD combinations (line 60), consisting of a ROUND UP! symbol on reel I *(i.e.,* reel 14), a DOUBLE WILD symbol on reel 2 *(i.e.,* reel 16), and a WILD symbol on reel 3 *(i.e.,* reel 18), the "#/Reel" values are 4, 1 and 1, respectively, thus defining a "Hits" value of 4 *(i.e.,* 4 x I x 1). The sum of the three "Hits" values, 24, defines the total number of "Hits" of the ROUND UP!/DOUBLE WILD combinations 56, 58, 60.

[0023] The combinations identified on lines 76 through 162 comprise, in order of descending value, various traditional winning combinations and combination 164 *(i.e.,* Anything, Anything, Anything) comprises a losing symbol combination which may occur in the JACKPOT STAMPEDE™ game. The "# PER REEL" and "Hits" values for each of these combinations are computed in similar fashion to those heretofore described.

[0024] FIG. 4 is a table summarizing payoffs, probabilities and expected values associated with the occurrence of the standard winning combinations identified in FIG. 3 in the basic mode of the JACKPOT STAMPEDE™ game. The standard winning combinations are designated in FIG. 4 with the following notations: "W DW W" (corresponding to the combination identified in line 52 of FIG. 3a); "W W W" (line 54); "RU DW" (lines 56, 58, 60); "Round Up" (lines 62 through 74); "3-BAR DW" (lines 76, 78, 80); "3-BAR" (lines 82 through 94); "2-BAR DW" (lines 96, 98, 100); "2-BAR" (lines 102 through 114); "1-BAR DW" (lines 116, 118, 120); "1-BAR" (lines 122 through 134); "2 Wild DW" (lines 136, 138); "2 Wild" (lines 140, 142, 144); "any bar DW" (line 146); "any bar" (lines 148, 150, 152, 154); "1 Double Wild" (line 156); and "1 Wild" (lines 158, 160, 162).

[0025] The "1 coin," "2 coin" and "3 coin" columns identify, respectively, the payoff amounts associated with the various combinations in FIGs. 3 and 4. In the case of the traditional winning combinations, the payoff amounts are predetermined amounts stored in system memory. Specifically, in the embodiment shown in FIG. 4, the "W DW W" combination (line 52, FIG. 3a) will award 400 coins or credits in a 1-coin game, 800 coins or credits in a 2-coin game and 1600 coins or credits in a 3-coin game; the "W W W" combination (line 54) will award 125 coins or credits in a 1-coin game, 250 coins or credits in a 2-coin game and 400 coins or credits in a 3-coin game; the "3-BAR DW" combination (lines 76, 78, 80) will award 60 coins or credits in a 1-coin game, 120 coins or credits in a 2-coin game and 180 coins or credits in a 3-coin game; the "3-BAR" combination (lines 82 through 94) will award 30 coins or credits in a 1-coin game, 60 coins or credits in a 2-coin game and 90 coins or credits in a 3-coin game; the "2-BAR DW" combination (lines 96, 98, 100) will award 40 coins or credits in a 1-coin game, 80 coins or credits in a 2-coin game and 120 coins or credits in a 3-coin game; the "2-BAR" combination (lines 102 through 114) will award 20 coins or credits in a 1-coin game, 40 coins or credits in a 2-coin game and 60 coins or credits in a 3-coin game; the "1-BAR DW" combination (lines 116, 118, 120) will award 20 coins or credits in a 1-coin game, 40 coins or credits in a 2-coin game and 60 coins or credits in a 3-coin game; the "1-BAR" combination (lines 122 through 134) will award 10 coins or credits in a 1-coin game, 20 coins or credits in a 2-coin game and 30 coins or cr dits in a 3-coin game; the "2 Wild DW" combination (lines 136, 138) will award 10 coins or credits in a 1-coin game, 20 coins or credits in a 2-coin game and 30 coins

or credits in a 3-coin game; the "2 Wild" combination (lines 140, 142, 144) will award 5 coins or credits in a 1-coin game, 10 coins or credits in a 2-coin game and 15 coins or credits in a 3-coin game; the "any bar DW" combination (line 146) will award 10 coins or credits in a 1-coin game, 20 coins or credits in a 2-coin game and 30 coins or credits in a 3-coin game; the "any bar" combination (lines 148, 150, 152, 154) will award 5 coins or credits in a 1-coin game, 10 coins or credits in a 2-coin game and 15 coins or credits in a 3-coin game; the "1 Double Wild" combination (line 156) will award 2 coins or credits in a 1-coin game, 4 coins or credits in a 2-coin game and 6 coins or credits in a 3-coin game; and the "1 Wild" combination (lines 158, 160, 162) will award 1 coin or credit in a 1-coin game, 2 coins or credits in a 2-coin game and 3 coins or credits in a 3-coin game.

[0026] In the case of the "start-bonus" combinations, the payoff amounts represent average payoff amounts which may be expected in the bonus game. Specifically, bonus games started with "RU DW" combinations (lines 56, 58, 60) will pay, on average, 38.92 coins or credits in a 1-coin game, 77.85 coins or credits in a 2-coin game and 116.77 coins or credits in a 3-coin game. Bonus games started with "Round Up" combinations (lines 62 through 74) will pay half those amounts, specifically 19.46 coins or credits in a 1-coin game, 38.92 coins or credits in a 2-coin game and 58.38 coins or credits in a 3-coin game.

[0027] The "Pulls/Hit" column of FIG. 4 identifies, on average, the number of pulls that would be required to "hit" each respective symbol combination. Where the reels each have twenty-four reel stop positions, as in the JACKPOT STAMPEDE™ game, there are 13,824 (24 x 24 x 24) possible symbol combinations. The "Pulls/Hit" value for any particular combination is determined by dividing the number of possible combinations (*i.e.*, 13,824) by the "Hits" value associated with that combination. As heretofore described, the "Hits" value for any particular combination is a function of the number of reel positions of the symbols supporting that combination. For example, because there is only one reel position on each of reels 14, 16, 18 that will support the "WILD, DOUBLE WILD, WILD" symbol combination, the "Hits" value for that combination is 1 and the "Pulls/Hit" value is 13,824 (*i.e.* 13,824 ÷ 1). Thus, it would take 13,824 pulls, on average, to "hit" the "WILD, DOUBLE WILD, WILD" symbol combination.

[0028] Next consider the "RU DW" outcome of FIG. 4. The "RU DW" outcome occurs upon the display of ither of the three combinations identified in lines 56, 58 and 60 of FIG. 3 in alignment with center payline 22 of the slot machine 10. The "Hits" value for each combination is 16, 4 and 4, respectively. The total number of "Hits" supporting the three "RU DW" combinations is therefore 24 and the "Pulls/Hit" value is 576 (*i.e.* 13,824 ÷ 24). Thus, it would take 576 pulls, on average, to "hit" any one of the "RU DW" combinations.

[0029] The "Pulls/Hit" values for the remaining outcomes of FIG. 4 are computed in like fashion. The "Pulls/Hit" value at the bottom of the column (*i.e.*, 4.57) represents the number of pulls, on average, that would be required to hit any of the winning combinations. This is computed by dividing the number of possible symbol combinations (*i.e.*, 13,824) by the total number of "Hits" supporting winning combinations in FIG. 3 (*i.e.*, 3,025).

[0030] The "Probability" column identifies the probabilities of hitting the winning outcomes in FIG. 4 in a single spin. This is computed for each outcome by taking the inverse of the "Pulls/Hit" value associated with that outcome. Thus, for example, the probability of hitting a "3BAR" combination is 1 divided by 864, or 0.001157 The number at the bottom of the Probability column (*i.e.*, 0.219) represents the probability of hitting *any* of the combinations of FIG. 4 in a single spin.

[0031] The "1 coin EV," "2 coin EV" and "3 coin EV" columns identify the normalized expected values of the winning outcomes in FIG. 4 for a 1-coin game, 2-coin game and 3-coin game, respectively. These values are computed for each outcome by taking the product of the respective "1 coin," "2 coin" or "3 coin" pay value associated with that outcome and the "Probability" value associated with that outcome, then dividing by the number of coin(s) played Thus, for example, the 2BAR outcome has a 1-coin expected value of 0.062211 (20 x 0.003111 ÷ 1), a 2-coin expected value of 0.062211 (40 x 0.003111 ÷ 2) and a 3-coin expected value of 0.062211 (60 x 0.003111 ÷ 3). The payout rate of the basic game is computed independently for a 1-coin, 2-coin and 3-coin game by summing the normalized expected values in the respective "1 coin EV," "2-coin EV" and "3 coin EV" columns. Thus, the payout rates for a 1-coin and 2-coin game are 0.911 (91.1%) and the payout rate for a 3-coin game is 0.922 (92.2%).

[0032] The "Max Contribution" column indicates, for a 3-coin game, the percentage contribution of the respective "3 coin EV" values to the total payout rate for a 3-coin game. Thus, for example, for the "Round Up" outcome, the contribution is 23% (0.208355 ÷ 0.922). The remaining "Max Contribution" values are computed in similar fashion.

[0033] FIG. 5 is a flow diagram identifying various steps in implementation of a bonus game with a collection-based award feature according to one embodiment of the present invention. Each of the steps will be described with reference to the JACKPOT STAMPEDE™ game. It will be appreciated, however, that the present invention is not limited to the JACKPOT STAMPEDE™ game or any other particular game. Start of the bonus game (or bonus "round") (step 200) is triggered by the display of a designated start-bonus combination (*e.g.*, a "Round Up" or "RU DW" combination) on the center payline 22 of the slot machine 10 in basic mode. Generally, the bonus round consists of spinning the r ls 14, 16, 18 under processor control a fixed numb r of times, each consecutive spin defining a "bonus spin." The bonus spins may be performed automatically under proc-

essor control or in response to player input *(e.g.,* pulling a lever or depressing a start button), but generally do not require the play of any additional coins or credits other than the amount played in the basic game.

[0034] In step 202, a game controller *(e.g.,* processor) determines the number of bonus spins to be afforded in the bonus round. This may be accomplished by the processor executing a game program defining the number of bonus spins. For example, in one embodiment, the bonus round is defined by the game to include five bonus spins for any start-bonus combination. It will be appreciated, however, that the bonus round may be defined by the game program to include any number of bonus spins, and/or the number(s) of bonus spins may be varied in response to the particular start-bonus combination which triggered the bonus game. For example, in an alternative embodiment, a bonus game started in response to "Round Up" combination might consist of five bonus spins, whereas a bonus game started in response to a "Round Up Double Wild" combination might consist of ten bonus spins.

[0035] Once the number(s) of bonus spins are designated, a counting means associated with the processor monitors the spins and provides feedback to the processor to ensure that the proper number of bonus spins are accomplished in the bonus round. In step 204, the counting means sets a "Spin" variable to 1, indicating that the next spin will be the first bonus spin. Then, in step 206, the processor spins the reels 14, 16, 18, randomly selects a stop position of the reels 14, 16, 18 and causes the reels to stop at the selected stop position in generally the same manner as in the basic game. In each bonus spin, the symbols displayed on the reels 14, 16, 18 at the selected stop position (step 208) define a symbol group consisting of various symbols displayed at nine display positions (e.g., an upper, center, and lower display position on each of the reels 14, 16, 18).

[0036] In one embodiment, the reels 14, 16, 18 spun in the bonus round are the same reels 14, 16, 18 spun in the basic game and include the same symbols. It will be appreciated, however, that the bonus game may employ separate reels or simulated mechanical reels illustrated on the video display 24, and/or may include different symbols. In an embodiment of the JACKPOT STAMPEDE™ game including the same symbols, the symbols eligible for display in the bonus game include the "standard" symbols WILD, DOUBLE WILD, 3-BAR, 2-BAR, 1-BAR, ROUND UP! and Blank and "bonus collection" symbols COW and CASH COW. As described in relation to FIG. 2, the COW and CASH COW symbols are displayed on top of (and thereby share the same reel stopping position as) some of the standard symbols.

[0037] The symbols displayed on the reels in each bonus spin define a bonus game outcome. The amount of coins or credits awarded to the player in the bonus game is determined by the cumulative value of any standard winning combination(s) occurring in the bonus spins, plus the cumulativ value of any bonus collection symbols *(e.g.,* COW and CASH COW symbols) appearing on reels 14, 16, 18 in the bonus spins.

[0038] In step 210, a symbol evaluation means *(e.g.,* the game controller) evaluates the symbol group appearing on the reels 14, 16, 18 of the slot machine in the present spin *(e.g.,* the first bonus spin) and determines whether the symbol group includes a standard winning combination. In one embodiment of the JACKPOT STAMPEDE™ game, the symbol group is determined to include a standard winning combination if the three-symbol combination aligned with the center payline 22 corresponds to one of the winning combinations identified in FIG. 6. In one embodiment, the standard winning combinations identified in FIG. 6 are the same as the standard winning combinations which may occur in the basic game (FIG. 4) and have the same probability of occurrence in either the basic game or bonus game.

[0039] If the symbol group is determined to include a winning combination, the game controller (e.g., processor) determines the amount of payoff associated with the combination at step 212. In one embodiment, if the bonus mode has been entered at step 200 in response to a "Round Up" combination, the processor will determine the pay value(s) for standard winning combination (s) according to the values shown in FIG. 6. If, however, the bonus mode has been entered at step 200 in response to a "RU DW" combination, the processor will determine the pay value(s) for standard winning combination(s) to be twice that of the values shown in FIG. 6.

[0040] Generally, with the exception of the "Round Up" and "RU DW" combinations, the combinations identified in FIG. 6 have the same pay values upon their occurrence in the bonus round as they would have in the basic mode (FIG. 4), whereas the "Round Up" and "DW" combinations have different pay values in the basic mode (FIG. 4) and the bonus mode (FIG. 6). For example, the 1-coin pay value of the "RU DW" combination in the basic mode (FIG. 4) is 38.92 coins or credits, whereas the 1-coin pay value for the same combination in the bonus mode (FIG. 6) is 20 coins or credits. Different pay amounts may also be found by comparing the 2-coin and 3-coin pay values of the "RU DW" combination in FIG. 4 and FIG. 6, or by comparing any of the 1-coin, 2-coin or 3-coin pay values for the "Round Up" combination in FIG. 4 and FIG. 6.

[0041] Generally, these differences may be attributed to a change in status of the respective combinations upon the transition from the basic mode to the bonus mode. More particularly, in one embodiment of the present invention, there can be no bonus round within a bonus round. Consequently, whereas the "Round Up" and "RU DW" combinations occurring in the basic mode (FIG. 4) define start-bonus combinations and trigger play of the bonus round, the same combinations occurring in th bonus mode (FIG. 6) do not trigger play of another bonus round but rather result in fixed payoff(s) of coins or credits. Thus, the pay values shown in FIG. 4 for the occurrence of the "Round Up" and "RU DW"

combinations in the basic mode are average pay values which may be expected in the bonus round, whereas the pay values shown in FIG. 6 for those same combinations are fixed to a predetermined value.

[0042] After the standard payoff associated with the present bonus spin *(e.g.,* the first bonus spin) has been determined at step 212, or after the present bonus spin has been determined not to include a standard winning combination at step 210, the process proceeds to step 214. At step 214, the symbol evaluation means *(e.g.,* processor) evaluates the symbol group associated with the present bonus spin for the presence of bonus collection symbols, which in the JACKPOT STAMPEDE™ game comprise COW and CASH COW symbols. In one embodiment, the symbol group is determined at step 214 to include bonus collection symbol(s) if bonus collection symbols *(e.g.,* COW and/or CASH COW symbol (s)) are displayed in any of the nine display positions of the symbol group. Specifically, in the JACKPOT STAMPEDE™ game, the symbol group is determined to include bonus collection symbols if COW or CASH COW symbol(s) are displayed in any combination of the upper, center or lower display positions of reel 14, 16 and 18.

[0043] At step 216, if the symbol group is determined to include any bonus collection symbols, the game controller *(e.g.,* processor) causes the video display 24 to display an appropriate animation representing the bonus collection symbol(s) appearing in the symbol group. Thus, for example, if the symbol group in the first bonus spin includes two COW symbols and one CASH COW symbol, the processor at step 216 causes the video display 24 to display two animated COW symbols and one animated CASH COW symbol. This step is repeated for each consecutive bonus spin to display the cumulative number(s) of collection symbol(s) appearing (or "collected") in the bonus round.

[0044] In step 218, the game controller *(e.g.,* processor) determines the amount of payoff associated with the collection symbols appearing in the bonus round. As will be appreciated, this step may be accomplished independently for each bonus spin or deferred until completion of all bonus spins (at step 224). In the JACKPOT STAMPEDE™ game, COW symbols collected in the bonus round have a fixed value corresponding to the number of coins or credits played upon entering the bonus round and also corresponding to the symbol combination (e.g., "Round Up" or "Round Up Double Wild") which triggered the bonus round. In one embodiment, if one coin or credit is played in the basic game and a "Round Up" combination triggers a JACKPOT STAMPEDE™ bonus game, every COW symbol displayed (or "collected") in the bonus round has a value of 1 coin or credit. Similarly, if two or three coins or credits are played in the basic game and a "Round Up" combination triggers play of a JACKPOT STAMPEDE™ bonus game, every COW symbol displayed in the bonus round has a value of 2 or 3 coins or credits, respectively. For any number of coin(s) or credit(s) played, if the bonus round has been entered in response to a "Round Up Double Wild" combination, the values of the COW symbols are doubled. Thus, COW symbols collected in a bonus round started with a "Round Up Double Wild" combination have respective values of 2 coins or credits in a 1-coin game, 4 coins or credits in a 2-coin game and 6 coins or credits in a 3-coin game.

[0045] In one embodiment of the JACKPOT STAMPEDE™ game, CASH COW symbols collected in the bonus round have a value which is randomly determined by the game controller at step 218 and determined independently for each CASH COW symbol. The determination of CASH COW value(s) may be accomplished after each bonus spin or may be deferred until completion of all bonus spins (at step 224). Specifically, for each CASH COW symbol appearing in the bonus round, the processor randomly selects a base value from a table of CASH COW base values stored in system memory, then computes the product of the base value and one or more multipliers to determine the value of that CASH COW.

[0046] In one embodiment, the table of base values from which the base value is selected comprises 30 individual base values stored in game memory, each of which has a one-in-thirty chance to be selected. The individual base values are: 5 (15 occurrences), 10(5 occurrences), 15 (6 occurrences), 20(1 occurrence), 30(1 occurrence), 40(1 occurrence) and 50(1 occurrence). The average base value is 11.833. It will be appreciated that the number of base values and/or their amounts may be varied to effect different payouts by altering the game program.

[0047] In one embodiment, the selected base value corresponding to each CASH COW is multiplied by one or more multipliers to determine the value of that CASH COW. The multipliers are determined by the number of coins played and/or by the symbol combination (e.g., "Round Up" or "Round Up Double Wild") which triggered the bonus round. Specifically, if the bonus round has been entered in a 1-coin game and in response to a "Round Up" combination, the value of each CASH COW is determined by the processor to be the product of the randomly selected base value and a "1X" multiplier. Similarly, if the bonus round has been entered in response to a "Round Up" combination in a 2-coin or 3-coin game, the value of each CASH COW is determined by the processor to be the product of the randomly selected base value and a "2X" or "3X" multiplier, respectively. If the bonus round has been entered in response to a "RU DW" combination, the values of the CASH COW symbols are doubled. Thus, CASH COW symbols collected in a bonus game started with a "Round Up Double Wild" combination have a value of "2X" times the randomly selected base value in a 1-coin game, "4X" times the randomly selected base value in a 2-coin game and "6X" times the randomly selected base value in a 3-coin game.

[0048] After the amount of payoff associated with the

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collection symbols in the present bonus spin *(e.g.,* the first bonus spin) has been determined (step 218) or after the present bonus spin has been determined not to include any bonus collection symbols (step 214), the counting means evaluates at step 220 whether the present spin is the last bonus spin. If the present spin is not the last bonus spin, the counting means increments at step 222 the "Spin" variable by 1 and the process is repeated beginning with step 206. Thus, for example, where the bonus round is defined to include five spins and where the present spin is the first spin, the counting means at step 222 will add one to the "Spin" variable to indicate that the next spin is the second spin. After the designated number of bonus spins *(e.g.,* five spins) are completed thereby causing the counting means to determine at step 220 that the present spin is the last spin, the process proceeds to step 224 to compute the bonus game payoff. As will be appreciated, the counting of bonus spins may be accomplished in any of several ways. For example, in one embodiment, the counting means might start with a "Spin" variable equal to the maximum number of bonus spins and decrement by one after each spin.

[0049] In step 224 the bonus game payoff is determined by the game controller by summing any standard payoff(s) computed at step 212 and any collection payoff(s) computed at step 216. Alternatively, the standard payoff(s) and/or collection payoff(s) and their sum may be computed independently at step 224 without reliance on steps 212 or 218 (e.g., with elimination of steps 212 and/or 216). In such alternative embodiment, the computation of standard payoff(s) and/or collection payoff (s) at step 224 is accomplished in generally the same manner as described in relation to steps 212 and 216. After computation of the bonus game payoff, the player is awarded a number of coins or credits corresponding to the bonus game payoff at step 226 and the bonus game is ended at step 228, causing the processor to return to the basic mode.

[0050] FIG. 7 identifies various possible configurations of bonus game collection symbols which may appear in the JACKPOT STAMPEDE™ game and their probabilities of occurring on each reel. More specifically, the entries on the left-hand column of FIG. 7 identify various bonus game symbol outcomes and orientations which may occur on each respective reel in the JACKPOT STAMPEDE™ bonus game. Other than the "non-winners" entry, each symbol outcome, if displayed on either of *reels* 14, 16, 18, includes at least one bonus game collection symbol. The "non-winners" entry represents various symbol outcomes which do not contain any bonus game collection symbols. The "Reel 1," "Reel 2" and "Reel 3" columns identify, respectively, the number of stop positions of reels 14, 16, 18 (see FIG. 2) that will support the various symbol outcomes identified in the left-hand column. The "Prob/Reel 1," "Prob/Reel 2" and "Prob/Reel 3" columns indicate, respectively, the probability of the various symbol outcomes occurring on reels 14, 16, 18.

[0051] The symbol outcomes and probabilities identified in FIG. 7 will hereinafter be described in detail. First consider the "Payline Cash Cow" outcome. This refers to the display of a CASH COW symbol on the center payline 22 of either of the reels 14, 16, or 18. As may be observed in FIG. 2, reel strips 14 and 18 do not include any CASH COW symbols. Thus, there are no stop positions on reel 14 *(i.e.,* "Reel 1") or reel 18 *(i.e.* "Reel 3") which will support the "Payline Cash Cow" outcome. Consequently, the probabilities of the "Payline Cash Cow" outcome occurring on reel 14 *(i.e.,* "Prob/Reel 1") or reel 18 *(i.e.* "Prob/Reel 3") are zero. Reel strip 16, however, includes one CASH COW symbol. Thus, there is one stop positions on reel 16 *(i.e.,* "Reel 2") which will support the "Payline Cash Cow" outcome. Consequently, the probability of the "Payline Cash Cow" outcome occurring on reel 16 is 0.041667 *(i.e.,* 1 ÷ 24).

[0052] Next consider the "Blank Cash Cow High" and "Blank Cash Cow Low" outcomes. These refer to the display of a Blank symbol on the center display position and a CASH COW symbol on the upper display position or lower display position, respectively, on either of the reels 14, 16, or 18. Because there are no CASH COW symbols on reel 14 or 16, there are no stop positions on reel 14 *(i.e.,* "Reel 1") or reel 18 *(i.e.* "Reel 3") which will support the "Blank Cash Cow High" or "Blank Cash Cow Low" outcomes. Consequently, the probabilities of either the "Blank Cash Cow High" or "Blank Cash Cow Low" outcomes occurring on reel 14 *(i.e.,* "Prob/Reel 1") or reel 18 *(i.e.* "Prob/Reel 3") are zero. Because reel strip 16 includes one CASH COW symbol, with Blank symbols both above and below, there is one stop positions on reel 16 *(i.e.,* "Reel 2") that will support the "Blank Cash Cow High" outcome and one stop position on reel 16 that will support the "Blank Cash Cow Low" outcome. Consequently, the probabilities of either the "Blank Cash Cow High" or "Blank Cash Cow Low" outcome occurring on reel 16 *(i.e.,* "Prob/Reel 2") is 0.041667 *(i.e.,* 1 ÷ 24).

[0053] The "Payline Cows" outcome refers to the display of a COW symbol (other than a CASH COW) on the center payline 22 of either of the reels 14, 16, or 18. As may be observed in FIG. 2, reel strip 14 includes four COW symbols, reel strip 16 includes four COW symbols and reel strip 18 includes five COW symbols. Thus, there are four stop positions on reel 14 *(i.e.,* "Reel 1"), four stop positions on reel 16 *(i.e.,* "Reel 2") and five stop positions on reel 18 *(i.e.,* "Reel 3") which will support the "Payline Cows" outcome. The probability of the "Payline Cows" outcome occurring on reels 14 or 16 *(i.e.,* "Prob/Reel 1" and "Prob/Reel 2") is 0.16667 *(i.e.,* 4 ÷ 24) and the probability of the "Payline Cows" outcome occurring on reel 18 *(i.e.,* "Prob/Reel 3") is 0.208333 *(i.e.,* 5 ÷ 24).

[0054] The "Blank High" and "Blank Low" outcomes refer to the display of a Blank symbol on the center display position and a single COW symbol (other than a CASH COW) on the upper display position or lower dis-

play position, respectively, on either of the reels 14, 16, or 18, whereas the "Blank High/Low" outcome refers to the display of a Blank symbol on the center display position and COW symbols (other than CASH COWs) on *both* the upper display position and lower display position of the reels 14, 16, or 18. First consider the "Blank High/Low" outcome. As may be observed in FIG. 2, only one of the Blank symbols on reel strips 14 and 18 has a COW symbol on both sides (e.g., both "High"and "Low") and therefore there is only one stop position on reels 14 and 18 which will support the "Blank High/Low" outcome. Reel strip 16, however, has two Blank symbols with COW symbols both "High" and "Low" and therefore there are two stop positions on reel 16 which will support the "Blank High/Low" outcome. The probability of the "Blank High/Low" outcome occurring on reels 14 or 18 *(i.e.,* "Prob/Reel 1" and "Prob/Reel 3") is 0.041667 *(i.e.,* 1 ÷ 24) and the probability of the "Blank High/Low" outcome occurring on reel 16 *(i.e.,* "Prob/Reel 2") is 0.008333 *(i.e.,* 2 ÷ 24).

[0055] The "non-winners" outcome refers to the display of various sets of three consecutive symbols on reels 14, 16 or 18 which do not contain any COW symbols or CASH COW symbols. Stated differently, a "non-winners" outcome in the context of FIG. 7 defines an outcome on respective reels 14. 16 or 18 which does not contribute to the collection portion of the bonus game payoff. It is important to note, however, that a "non-winners" outcome may contribute to the standard portion of the bonus game payoff, where the symbol group displayed on reels 14, 16, 18 includes a standard winning combination which does not include a COW or CASH COW symbol on either of reels 14, 16, 18.

[0056] The numbers of "non-winners" identified in FIG. 7 are computed for each reel by subtracting the number of reel stop positions for that reel which include collection symbols from the total number of *reel* stop positions. Specifically, for reel strip 14 *(i.e.,* "Reel 1"), there are 11 reel stop positions which include collection symbols-- 4 stop positions supporting the "Payline Cow" outcome, 3 stop positions supporting the "Blank High" outcome, 3 stop positions supporting the "Blank Low" outcome and 1 stop position supporting the "Blank High/Low" outcome. The number of "non-winners" on reel strip 14 is therefore 13 (i.e., 24 - 11) and the probability of a "non-winner" occurring on reel 14 *(i.e.,* "Prob/Reel 1") is 0.541667 *(i.e.,* 13÷ 24). For reel strip 16 *(i.e.,* "Reel 2"), there are 13 reel stop positions which include collection symbols- 1 stop position supporting the "Payline Cash Cow" outcome, 1 stop position supporting the "Blank Cash Cow High" outcome, 1 stop position supporting the "Blank Cash Cow Low" outcome, 4 stop positions supporting the "Payline Cows" outcome, 2 stop positions supporting the "Blank High" outcome, 2 stop positions supporting the "Blank Low" outcome and 2 stop positions supporting the "Blank High/Low" outcom . The number of "non-winners" on reel strip 16 is therefore 11 (i. ., 24 - 13) and the probability of a "non-winner" occurring on reel 16 *(i.e.,* "Prob/Reel 2") is 0.45833 *(i.e.,* 11 ÷ 24). Finally, for reel strip 18 *(i.e.,* "Reel 3"), there are 14 reel stop positions which include collection symbols-- 4 stop positions supporting the "Payline Cows" outcome, 4 stop positions supporting the "Blank High" outcome, 4 stop positions supporting the "Blank Low" outcome and 1 stop position supporting the "Blank High/Low" outcome. The number of "non-winners" on reel strip 18 is therefore 10 (i.e., 24 - 14) and the probability of a "non-winner" occurring on reel 18 (*i.e.*, "Prob/Reel 3") is 0.41667 (*i.e.*, 10 ÷ 24).

[0057] It can be seen from FIG. 7 that there is a minimum of zero and a maximum of two COW symbols that may appear on any individual reel 14, 16, 18. Accordingly, there is a minimum of zero and a maximum of six COW symbols that may appear on the combination of reels 14, 16, 18. One may derive the probability of every possible number of COW symbols (i.e., from zero to six) which may appear on the combination of reels 14, 16, 18 in a single spin by first computing the probability per reel of either 0, 1 or 2 COW symbols appearing on that reel, determining the various combinations of 0, 1 or 2 COW symbols on each reel that will support a particular number of COW symbols in a single spin, then for each combination supporting that number of COW symbols, multiplying the appropriate probability per reel values to determine the probability of that combination occurring in a single spin. The probability of any particular number of COW symbols appearing in a single spin is the sum of the probabilities of the combinations supporting that number.

[0058] The probability per reel of either 0, 1 or 2 COW symbols appearing on each individual reel is computed as follows. The probability of no COWs occurring on any individual reel is simply the number of reel stop positions for that reel in which no COW symbols appear *(e.g.,* the "non-winners" plus any CASH COW outcomes) divided by the total number of reel stop positions. Similarly, the probability of one COW occurring on any individual reel is the number of reel stop positions for that reel in which one COW symbol appears *(e.g.,* the sum of "Payline Cows," "Blank High" and "Blank Low" outcomes) divided by the total number of reel stop positions. The probability of two COWs occurring on any individual reel is the number of reel stop positions for that reel in which two COW symbols appear *(e.g.,* the "Blank High/Low" outcome) divided by the total number of reel stop positions.

[0059] First consider the number of reel stop positions on respective reels 14, 16, 18 in which no COW symbols appear. For reel 14 *(i.e.,* "Reel 1"), there are 13 "non-winners" and no CASH COW outcomes, so the number of reel stop positions in which no COW symbols appear is 13 and the probability of no COWs appearing on reel 14 is therefore 0.541667 (*i.e.*, 13 ÷ 24). For re l 16 *(i.e.,* "R el 2"), there are 11 "non-winn rs" and three CASH COW outcom s, so the numb r of reel stop positions in which no COW symbols appear is 14 and th probability of no COWs appearing on reel 16 is therefore 0.58333

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(i.e., 14 ÷ 24). For reel 18 *(i.e.*, "Reel 3"), there are 10 "non-winners" and no CASH COW outcomes, so the number of reel stop positions in which no COW symbols appear is 10 and the probability of no COWs appearing on reel 18 is therefore 0.41667 *(i.e.*, 10 ÷ 24).

[0060] Next consider the number of reel stop positions on respective reels 14, 16, 18 in which one COW symbol appears. For reel 14, there are 4 "Payline Cows," 3 "Blank High" outcomes and 3 "Blank Low" outcomes, so the number of reel stop positions in which one COW symbol appears is 10 and the probability of one COW appearing on reel 14 is therefore 0.41667 *(i.e.*, 10 ÷ 24). For reel 16, there are 4 "Payline Cows," 2 "Blank High" outcomes and 2 "Blank Low" outcomes, so the number of reel stop positions in which one COW symbol appears is 8 and the probability of one COW appearing on reel 16 is therefore 0.3333 *(i.e.*, 8 ÷ 24). For reel 18, there are 5 "Payline Cows," 4 "Blank High" outcomes and 4 "Blank Low" outcomes, so the number of reel stop positions in which one COW symbol appears is 13 and the probability of one COW appearing on reel 18 is therefore 0.541667 *(i.e.*, 13 ÷ 24).

[0061] The number of reel stop positions on respective reels 14, 16, 18 in which two COW symbols appears is simply the number of "Blank High/Low" outcomes on each reel. For reel 14 and reel 18, there is 1 "Blank High/Low" outcome and therefore the probability of two COW symbols appearing on reel 14 or reel 18 is 0.041667 *(i.e.*, 1 ÷ 24). For reel 16, there are 2 "Blank High/Low" outcomes and therefore the probability of two COW symbols appearing on reel 16 is 0.08333 *(i.e.*, 2 ÷ 24).

[0062] The derivation of probability of certain numbers of COW symbols which may appear in a single spin will hereinafter be described in detail. First consider the probability of zero COW symbols appearing on the combination of reels 14, 16, 18. There is only one combination of 0, 1 or 2 COW symbols on each respective reel *(i.e.*, 0 COW symbols on reel 14,0 COW symbols on reel 16 and 0 COW symbols on reel 18) that will support zero COW symbols for the combination. The probabilities per reel associated with 0, 0 and 0 COW symbols on respective reels 14, 16, 18 are 0.541667, 0.58333 and 0.41667. The probability of zero COWs appearing in the combination is therefore 0.1316551.

[0063] The computation of probability of six COW symbols appearing on the combination of reels 14, 16, 18 is similar to that for zero COW symbols because there is only one combination of 0, 1 or 2 COW symbols on each respective reel (i.e., 2 COW symbols on reel 14, 2 COW symbols on reel 16 and 2 COW symbols on reel 18) that will support a total of six COW symbols. The probabilities per reel associated with 2, 2 and 2 COW symbols on respective reels 14, 16, 18 are 0.041667, 0.08333 and 0.041667. The probability of six COW symbols appearing in the combination is therefore 0.0001447.

[0064] The computation of probability of one, two, three, four or five COW symbols appearing on the combination of reels 14, 16, 18 in a single spin is somewhat more complicated than that for zero or six COW symbols because there are multiple combinations of 0, 1 or 2 COW symbols on each respective reel that will support those combinations. After the combinations supporting a particular number of COW symbols are determined, one must compute the probability of each combination and then sum the probabilities to determine the probability of that number of COW symbols occurring in a single spin. Consider, for example, the probability of one COW symbol appearing on the combination of reels 14, 16, 18. There are three combinations of 0, 1 or 2 COW symbols on each respective reel that will support a *total* of one COW symbol in a single spin. These combinations include: 1, 0 and 0 COW symbols, 0, 1 and 0 COW symbols and 0, and 1 COW symbols on respective reels 14, 16, 18. The probabilities per reel associated with 1, 0 and 0 COW symbols on respective reels 14, 16, 18 are 0.416667, 0.58333 and 0.41667 and the probability of that combination is therefore 0.101274. The probabilities per reel associated with 0, 1 and 0 COW symbols on respective reels 14, 16, 18 are 0.541667, 0.33333 and 0.41667 and the probability of that combination is 0.07523. The probabilities per *reel* associated with 0, 0 and 1 COW symbols on respective reels 14, 16, 18 are 0.541667, 0.58333 and 0.541667 and the probability of that combination is 0.171. The probability of one COW symbol appearing in a single spin, 0.3476563, is the sum of the probabilities of the three aforementioned combinations.

[0065] The probability of two, three, four or five COW symbols appearing in a single spin is computed in similar fashion and will not be described in detail herein. Suffice it to say that the probability of two COW symbols is 0.3294271, the probability of three COW symbols is 0.1507523, the probability of four COW symbols is 0.0364583 and the probability of five COW symbols is 0.0039063.

[0066] FIG. 8 summarizes the probabilities and expected values associated with various combinations of collection symbols which may appear in a single spin. The "Award" column identifies the normalized value of each possible outcome. As has been heretofore described, in one embodiment of the JACKPOT STAMPEDE™ game, the normalized value of each COW symbol is one coin or credit. Thus, in a 1-coin game, the appearance of six COWs in a single spin will result in an award of 6 coins or credits, five COWs will award 5 coins, and so on. The value of a CASH COW symbol in a 1-coin game, on average, is 11.833 coins or credits. In one embodiment, the actual award values for COW and CASH COW symbols are doubled relative to the normalized values in a 2-coin game and tripled in a 3-coin game. In on mbodiment, the award values are doubled still further for bonus rounds nt red with "Round Up Double Wild" combinations. Thus, the actual award values may be up to six tim s th normalized award values, in a 3-coin game ntered with a "Round

Up Double Wild" combination.

[0067] The "Pulls/Hit" column of FIG. 8 identifies, on average, the number of bonus spins that would be required to "hit" each respective combination of collection symbols This is computed for each combination by taking the inverse of the probability value associated with that outcome Specifically, the "Pulls/Hit" value is 6912 (i.e. 1 ÷ 0.0001447) for the "Six Cows" combination, 256 (i.e. 1 ÷ 0.0039063) for the "Five Cows" combination 27.42857 (i.e., 1 ÷ 0.0364583) for the "Four Cows" combination. 6.633397 (i.e., 1 ÷ 0.1507523) for the "Three Cows" combination, 3.035573 (i.e., 1 ÷ 0.3294271) for the "Two Cows" combination, 2.876404 (i.e. 1 ÷ 0.3476553) for the "Single Cow" combination, 7.595604 (i.e. 1 ÷ 0.1316551) for the "No Cows" combination and 8 (i.e. 1 ÷ 0.125) for a combination including the "Cash Cow" symbol

[0068] The "EV" column of FIG. 8 identifies the normalized expected value per spin associated with each respective combination of collection symbols, computed as the product of the probability of that combination *(i.e.* the value in the left hand column of FIG. 8) and the normalized award value of that combination. Specifically, the normalized expected value per spin is 0.000868 *(i.e.,* 0.0001447 x 6) for the "Six Cow" combination, 0.019531 *(i.e.* 0.0039063 x 5) for the "Five Cow" combination 0.145833 *(i.e.* 0.0364583 x 4) for the "Four Cow" combination. 0.452257 *(i.e.,* 0.1507523 x 3) for the "Three Cow" combination, 0.658854 *(i.e.,* 0.3294271 x 2) for the "Two Cow" combination, 0.347656 *(i.e.* 0.347656 × 1) for the "Single Cow" combination 0 for the "No Cows" combination and 1.479167 *(i.e.,* 0.125 × 11.8333) for a combination including a "Cash Cow" symbol The sum of each respective EV value, 3.104167. is the normalized expected value per spin of any combination of collection symbols. In a bonus round consisting of five bonus spins, the contribution to expected value from COW or CASH COW symbols is five times the expected value per spin, or 15.52083.

[0069] The normalized expected value per spin including contributions from both collection symbols and standard winning combinations is computed by summing the normalized expected value from standard winning combinations (FIG. 6) and the normalized expected value from collection symbols (FIG. 8). Thus, for example, in a 3-coin game, where the normalized expected value from standard winning combinations is 0.788122, the normalized expected value per spin including contributions from both collection symbols and standard winning combinations is 3.892289 (i.e., 0.788122 + 3.104167). In a bonus game consisting of five bonus spins, the normalized expected value is five times the expected value per spin, or 19.461445. It is noted again, however, that the actual award values for the bonus round are doubled relative to the normalized values in a 2-coin game and tripled in a 3-coin game, and doubled still further for bonus rounds entered with "Round Up Double Wild" combinations. Thus, the actual award values for the bonus round may be up to six times the normalized award values, or 116.76867, in a 3-coin game entered with a "Round Up Double Wild" combination.

[0070] While the present invention has been described with reference to one or more particular embodiments, those skilled in the art will recognize that many changes may be made thereto without departing from the spirit and scope of the present invention. Each of these embodiments and obvious variations thereof is contemplated as falling within the spirit and scope of the claimed invention, which is set forth in the following claims.

Claims

1. A slot machine for playing a game of chance having a collection-based award system, the slot machine comprising:

   a processor for defining a bonus round consisting of a fixed number of spins of the slot machine, the processor being adapted to randomly select an outcome for each spin in the bonus round;

   display means for displaying a number of symbol groups representing the respective outcomes of the spins in the bonus round, each symbol group including a number of collection symbols and a number of standard symbols;

   symbol group evaluation means associated with the processor for identifying the number of collection symbols displayed in the bonus round and for determining whether any of the symbol groups displayed in the bonus round include a combination of said standard symbols defining a standard winning combination;

   valuation means associated with the processor for determining collection payoff values associated with the collection symbols displayed in the bonus round and for determining standard payoff values associated with the standard winning combinations occurring in the bonus round;

   summation means associated with the processor for adding the collection payoff values of the collection symbols displayed in the bonus round and the standard payoff values associated with the standard winning combinations occurring in the bonus round to define a bonus round payoff value; and

   payoff means associated with the processor for awarding the bonus round payoff value.

2. A collection-based award method for a slot machine operable under processor control, the method comprising the steps of:

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defining under processor control a bonus round consisting of a fixed number of spins of the slot machine;
randomly selecting under processor control an outcome for each spin in the bonus round;
displaying under processor control a number of symbol groups representing the respective outcomes of the spins in the bonus round, each symbol group including a number of collection symbols;
assigning under processor control various collection payoff values to the collection symbols displayed in the bonus round;
adding the collection payoff values of the collection symbols displayed in the bonus round to define a cumulative collection payoff value; and
awarding under processor control the cumulative collection payoff value.

3. The method of claim 2 wherein each symbol group further includes a number of standard symbols, the method further comprising the steps of:

determining whether any of the symbol groups displayed in the bonus round include a combination of said standard symbols defining a standard winning combination; and
if any of the symbol groups are determined to include a standard winning combination,

determining the respective values of the standard winning combinations occurring in the bonus round;
summing the respective values of the standard winning combinations occurring in the bonus round to define a cumulative standard payoff value; and
awarding under processor control the cumulative standard payoff value.

4. The method of claim 2 wherein the step of assigning collection payoff values comprises:

identifying base values of the respective collection symbols displayed in the bonus round; and defining collection payoff values of the respective collection symbols proportional to their base values.

5. The method of claim 4 wherein the collection symbols comprise a number of first-type and a number of second-type collection symbols, the step of identifying base values comprising:

selecting a predetermined base value associated with each of the first-type symbols displayed in the bonus round; and
selecting a randomly determined base value for each of the second-type symbols displayed in the bonus round.

6. The method of claim 4 wherein the step of defining collection payoff values comprises:

selecting a bonus round multiplier; and
multiplying the base value of each respective collection symbol by the bonus round multiplier.

7. The method of claim 6 wherein the bonus round is entered upon playing a number of coins in a basic mode, the step of selecting a bonus round multiplier comprising selecting a bonus round multiplier proportional to the number of coins played in the basic mode.

8. The method of claim 6 wherein the bonus round is entered upon the display of a combination of symbols defining a start-bonus combination, the step of selecting a bonus round multiplier comprising:

identifying a multiplier associated with the start-bonus combination; and
selecting a bonus round multiplier corresponding to the multiplier associated with the start-bonus combination.

9. The method of claim 6 wherein the bonus round is entered upon playing a number of coins in a basic mode and upon the display of a combination of symbols defining a start-bonus combination, the step of selecting a bonus round multiplier comprising:

identifying the number of coins played in the basic mode;
identifying a multiplier associated with the start-bonus combination; and
selecting a bonus round multiplier corresponding to a product of the number of coins played in the basic mode and the multiplier associated with the start-bonus combination.

10. An award method for a slot machine operable under processor control, the method comprising the steps of:

defining under processor control a bonus round consisting of a fixed number of spins of the slot machine;
randomly selecting under processor control an outcome for each spin in the bonus round;
displaying under processor control a number of symbol groups representing the respective outcomes of the spins in the bonus round, each symbol group including a number of collection symbols and a number of standard symbols;

assigning under processor control various collection payoff values to the collection symbols displayed in the bonus round;
adding the collection payoff values of the collection symbols displayed in the bonus round to define a cumulative collection payoff value;
determining whether any of the symbol groups displayed in the bonus round include a combination of said standard symbols defining a standard winning combination and, if any of the symbol groups are determined to include a standard winning combination,

determining the respective values of the standard winning combinations occurring in the bonus round;
summing the respective values of the standard winning combinations occurring in the bonus round to define a cumulative standard payoff value;

awarding under processor control a bonus payoff comprising a sum of the cumulative collection payoff value and the cumulative standard payoff value.

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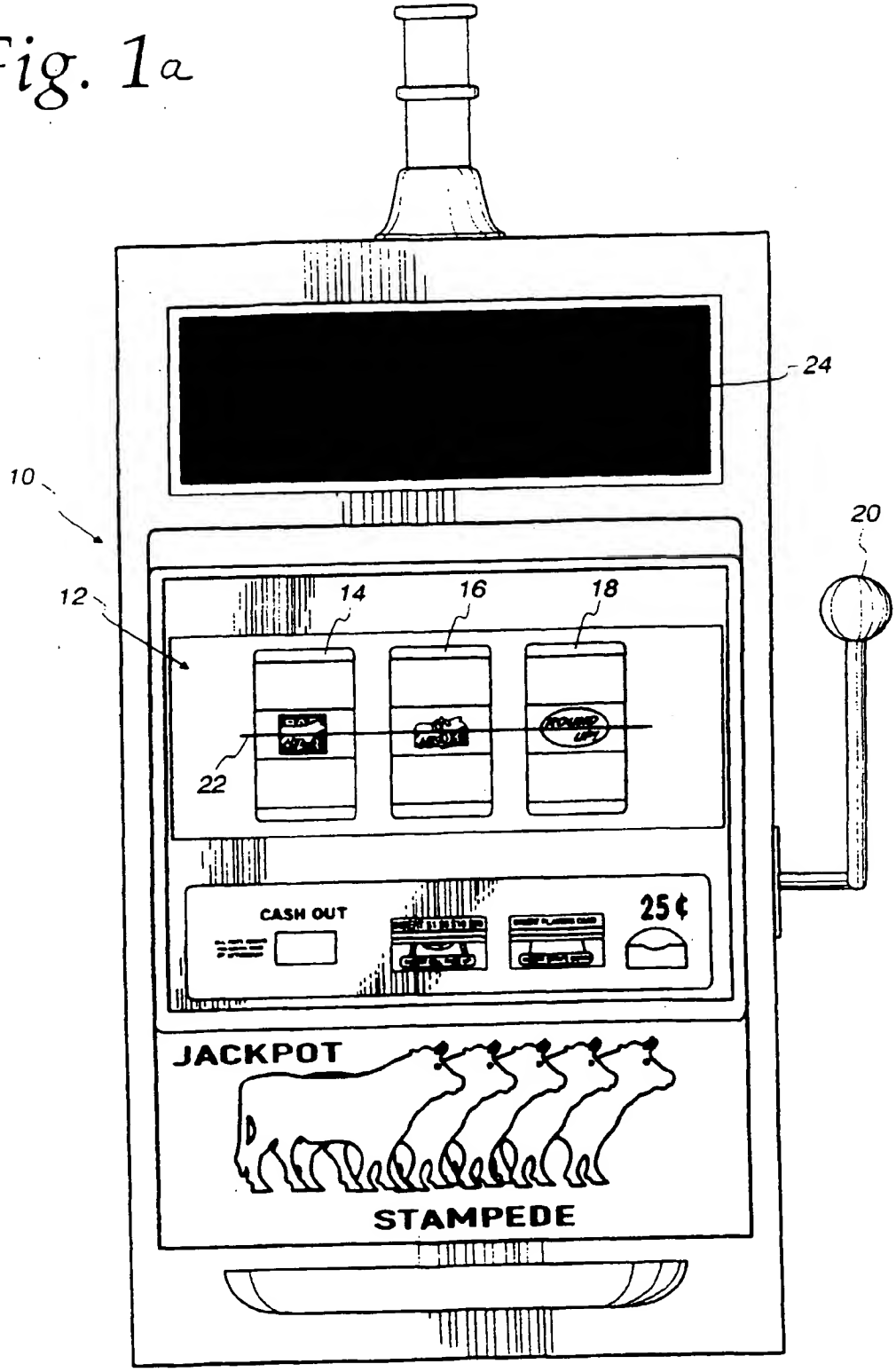
Fig. 1a



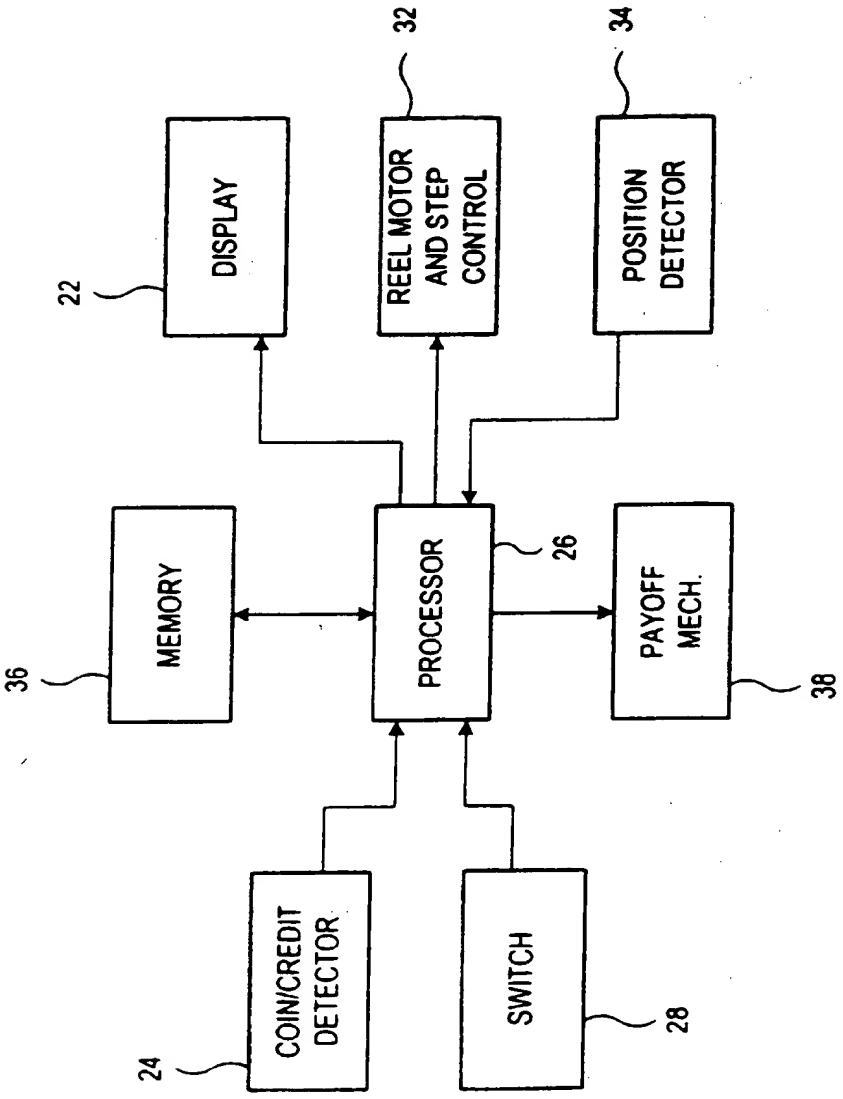


FIG. 1b

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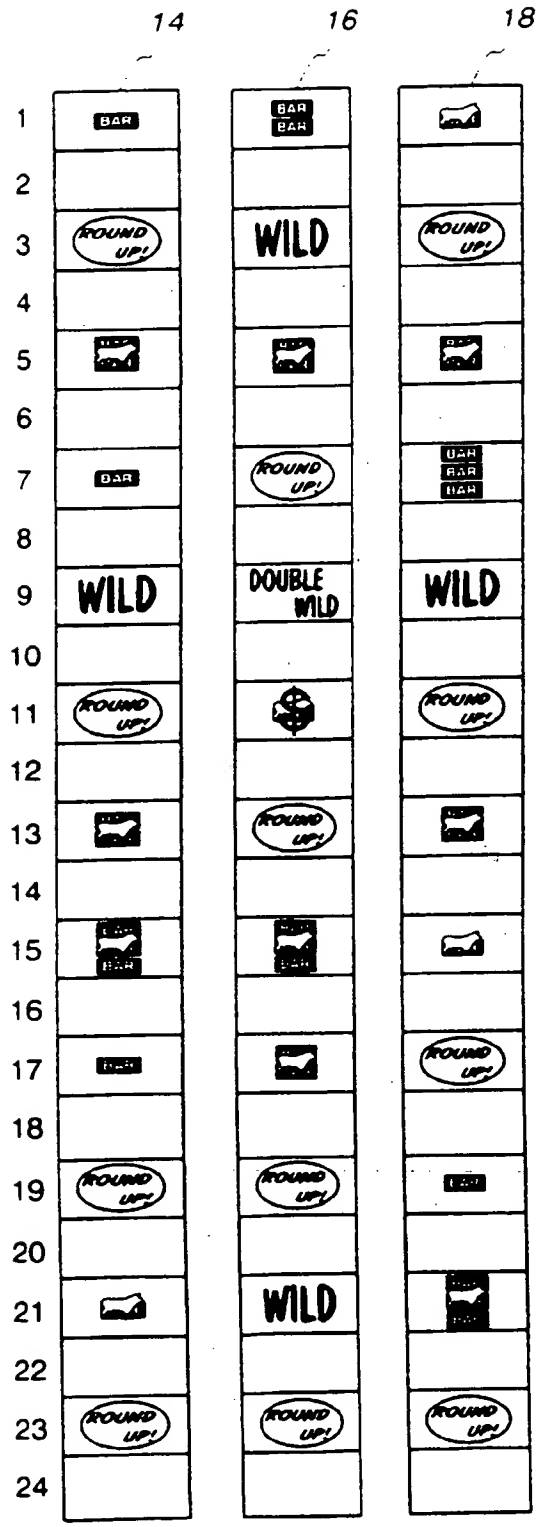
Fig. 2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BAR
WILD
DOUBLE WILD
ROUND UP!

Reel 1	Reel 2	Reel 3	#/Reel 1	#/Reel 2	#/Reel 3	Hits
Wild	Dbl. Wild	Wild	1	1	1	1
Wild	Wild	Wild	1	2	1	2
ROUNDup	Dbl. Wild	ROUNDup	4	1	4	16
Wild	Dbl. Wild	ROUNDup	1	1	4	4
ROUNDup	Dbl. Wild	Wild	4	1	1	4
ROUNDup	ROUNDup	ROUNDup	4	4	4	64
ROUNDup	ROUNDup	Wild	4	4	1	16
ROUNDup	Wild	ROUNDup	4	2	4	32
Wild	ROUNDup	ROUNDup	1	4	4	16
ROUNDup	Wild	Wild	4	2	1	8
Wild	ROUNDup	Wild	1	4	1	4
Wild	Wild	ROUNDup	1	2	4	8
3Bar	Dbl. Wild	3Bar	1	1	2	2
3Bar	Dbl. Wild	Wild	1	1	1	1
Wild	Dbl. Wild	3Bar	1	1	2	2
3Bar	3Bar	3Bar	1	1	2	2
Wild	3Bar	3Bar	1	1	2	2
3Bar	Wild	3Bar	1	2	2	4
3Bar	3Bar	Wild	1	1	1	1
3Bar	Wild	Wild	1	2	1	2
Wild	3Bar	Wild	1	1	1	1
Wild	Wild	3Bar	1	2	2	4

FIG. 3a

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	Reel 1	Reel 2	Reel 3	#/Reel 1	#/Reel 2	#/Reel 3	Hits
96	2Bar	Dbl. Wild	2Bar	2	1	2	4
98	2Bar	Dbl. Wild	Wild	2	1	1	2
100	Wild	Dbl. Wild	2Bar	1	1	2	2
102	2Bar	2Bar	2Bar	2	3	2	12
104	Wild	2Bar	2Bar	1	3	2	6
106	2Bar	Wild	2Bar	2	2	2	8
108	2Bar	2Bar	Wild	2	3	1	6
110	2Bar	Wild	Wild	2	2	1	4
112	Wild	2Bar	Wild	1	3	1	3
114	Wild	Wild	2Bar	1	2	2	4
116	1Bar	Dbl. Wild	1Bar	4	1	3	12
118	1Bar	Dbl. Wild	Wild	4	1	1	4
120	Wild	Dbl. Wild	1Bar	1	1	3	3
122	1Bar	1Bar	1Bar	4	1	3	12
124	Wild	1Bar	1Bar	1	1	3	3
126	1Bar	Wild	1Bar	4	2	3	24
128	1Bar	1Bar	Wild	4	1	1	4

FIG. 3b

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Reel 1	Reel 2	Reel 3	#/Reel 1	#/Reel 2	#/Reel 3	Hits
1Bar	Wild	Wild	4	2	1	8
Wild	1Bar	Wild	1	1	1	1
Wild	Wild	1Bar	1	2	3	6
Wild	Dbl. Wild	AnyThing	1	1	12	12
AnyThing	Dbl. Wild	Wild	12	1	1	12
Wild	Wild	AnyThing	1	2	12	24
Wild	AnyThing	Wild	1	12	1	12
AnyThing	Wild	Wild	12	2	1	24
AnyBar	Dbl. Wild	AnyBar	7	1	7	31
AnyBar	AnyBar	AnyBar	7	5	7	219
Wild	AnyBar	AnyBar	1	5	7	24
AnyBar	Wild	AnyBar	7	2	7	62
AnyBar	AnyBar	Wild	7	5	1	24
AnyThing	Dbl. Wild	AnyThing	24	1	24	464
Wild	AnyThing	AnyThing	1	24	24	432
AnyThing	Wild	AnyThing	24	2	24	928
AnyThing	AnyThing	Wild	24	24	1	432
AnyThing	AnyThing	AnyThing	24	24	24	10800

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FIG. 3c

STANDARD WINNING COMBINATIONS IN BASIC MODE

	1 coin	2 coin	3 coin	Pulls/Hit	Prob.	1 coin EV	2 coin EV	3 coin EV	Max Cont.
W DW W	400	800	1600	13824	7.23E-05	0 028935	0.028935	0.03858	4
W W W	125	250	400	6912	0.000145	0 018084	0.018084	0.01929	2
RU DW	38.92	77.85	116.77	576	0.001736	0.067574	0.067574	0.067574	7
Round Up	19.46	38.92	58.38	93	0.010706	0.208355	0.208355	0.208355	23
3BAR DW	60	120	180	2765	0.000362	0.021701	0.021701	0.021701	2
3BAR	30	60	90	864	0.001157	0.034722	0.034722	0.034722	4
2BAR DW	40	80	120	1728	0.000579	0.023148	0.023148	0.023148	3
2BAR	20	40	60	321	0.003111	0.062211	0.062211	0.062211	7
1BAR DW	20	40	60	728	0.001374	0.027488	0.027488	0.027488	3
1BAR	10	20	30	238	0.004196	0.041956	0.041956	0.041956	5
2 Wild DW	10	20	30	576	0.001736	0.017361	0.017361	0.017361	2
2 Wild	5	10	15	230	0.00434	0.021701	0.021701	0.021701	2
any bar DW	10	20	30	446	0.002242	0.022425	0.022425	0.022425	2
any bar	5	10	15	42	0.023799	0.118996	0.118996	0.118996	13
1DblWild	2	4	6	30	0.033565	0.06713	0.06713	0.06713	7
1 Wild	1	2	3	8	0.12963	0.12963	0.12963	0.12963	14
TOTAL:				4.57	0.219	0.911	0.911	0.922	100

FIG. 4

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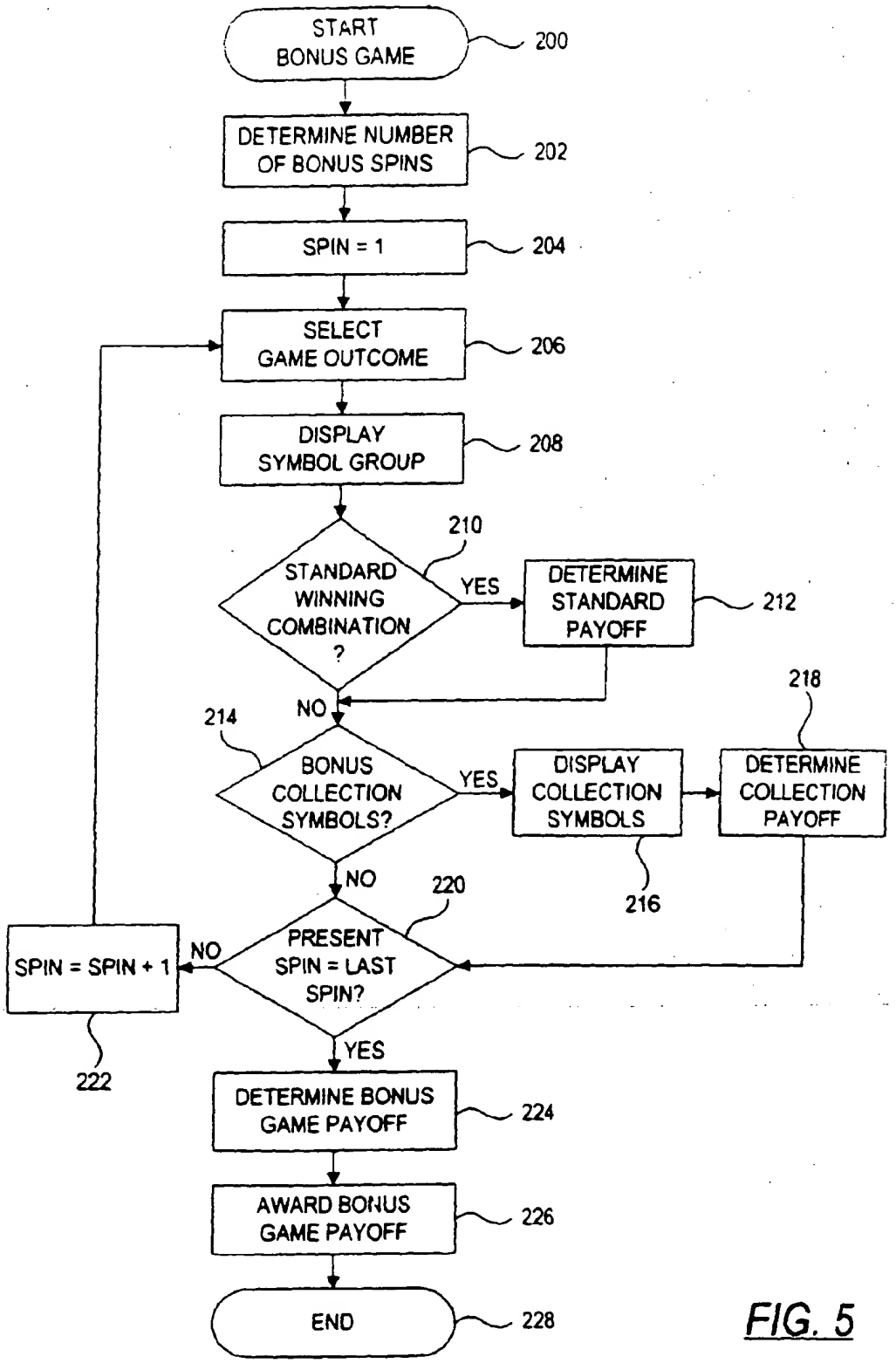

FIG. 5

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STANDARD WINNING COMBINATIONS IN BONUS MODE
ENTERED WITH ROUND UP COMBINATION

	1 coin	2 coin	3 coin	Hits	Pulls/Hit	Prob.	1 coin EV	2 coin EV	3 coin EV	Max Cont. (%)
W OW W	400	800	1600	1	13824	7.23E-05	0.028935	0.028935	0.03858	4
W W W	125	250	400	2	6912	0.000145	0.018084	0.018084	0.01929	2
RU DW	20	40	60	24	576	0.001736	0.034722	0.034722	0.034722	4
Round Up	10	20	30	148	93.40541	0.010706	0.10706	0.10706	0.10706	12
3BAR DW	60	120	180	5	2764.8	0.000362	0.021701	0.021701	0.021701	2
3BAR	30	60	90	16	864	0.001157	0.034722	0.034722	0.034722	4
2BAR DW	40	80	120	8	1728	0.000579	0.023148	0.023148	0.023148	3
2BAR	20	40	60	43	321.4884	0.003111	0.062211	0.062211	0.062211	7
1BAR DW	20	40	80	19	727.5789	0.001374	0.027488	0.027488	0.027488	3
1BAR	10	20	30	58	238.3448	0.004196	0.041956	0.041956	0.041956	5
2 Wild DW	10	20	30	24	576	0.001736	0.017361	0.017361	0.017361	2
2 Wild	5	10	15	60	230.4	0.00434	0.021701	0.021701	0.021701	2
any bar DW	10	20	30	31	445.9355	0.002242	0.022425	0.022425	0.022425	2
any bar	5	10	15	329	42.01824	0.023799	0.118996	0.118996	0.118996	13
1DblWild	2	4	6	464	29.7931	0.033565	0.06713	0.06713	0.06713	7
1 Wild	1	2	3	1,792	7.714286	0.12963	0.12963	0.12963	0.12963	14
TOTAL:					4.571429	0.21875	0.777271	0.777271	0.788122	85

FIG. 6

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	Reel 1	Prob/Reel 1	Reel 2	Prob/Reel 2	Reel 3	Prob/Reel 3
Payline Cash Cow	0	0	1	0.041667	0	0
Blank Cash Cow High	0	0	1	0.041667	0	0
Blank Cash Cow Low	0	0	1	0.041667	0	0
Payline Cows	4	0.166667	4	0.166667	5	0.208333
Blank High	3	0.125	2	0.083333	4	0.166667
Blank Low	3	0.125	2	0.083333	4	0.166667
Blank High/Low	1	0.041667	2	0.083333	1	0.041667
non-winners	13	0.541667	11	0.45833	10	0.416667

FIG. 7

	Prob.	Award	Pulls/Hit	EV
Six Cows	0.0001447	6	6912	0.000868
Five Cows	0.0039063	5	256	0.019531
Four Cows	0.0364583	4	27.42857	0.145833
Three Cows	0.1507523	3	6.633397	0.452257
Two Cows	0.3294271	2	3.035573	0.658854
Single Cow	0.3476563	1	2.876404	0.347656
No Cows	0.1316551	0	7.595604	0
CashCow	0.125	11.833333	8	1.479167
TOTAL:	1.125		0.888889	3.104167

FIG. 8

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(19) Europäisches Patentamt
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(71) Applicant: **WMS GAMING, INC.**
Chicago, Illinois 60618 (US)

(72) Inventors:
- **Thomas, Alfred**
  Chicago, IL 60611 (US)
- **Gomez, Benjamin T.**
  Chicago, Illinois 60657 (US)

(74) Representative: **Loisel, Bertrand**
Cabinet Plasseraud,
84, rue d'Amsterdam
75440 Paris Cédex 09 (FR)

(54) Slot machine with collection-based award feature

(57) A collection-based award system for a slot machine operable in a bonus round. The bonus round consists of a fixed number of spins of the reels of the slot machine. The outcome of each spin in the bonus round is represented by the display of a symbol group including various collection symbols and standard symbols. Each symbol group in the bonus round is evaluated for the presence of collection symbols and for the presence of standard symbols defining a standard winning combinations. Following the bonus round, a payoff is made to the player corresponding to the cumulative value of the collection symbols and standard winning combinations.

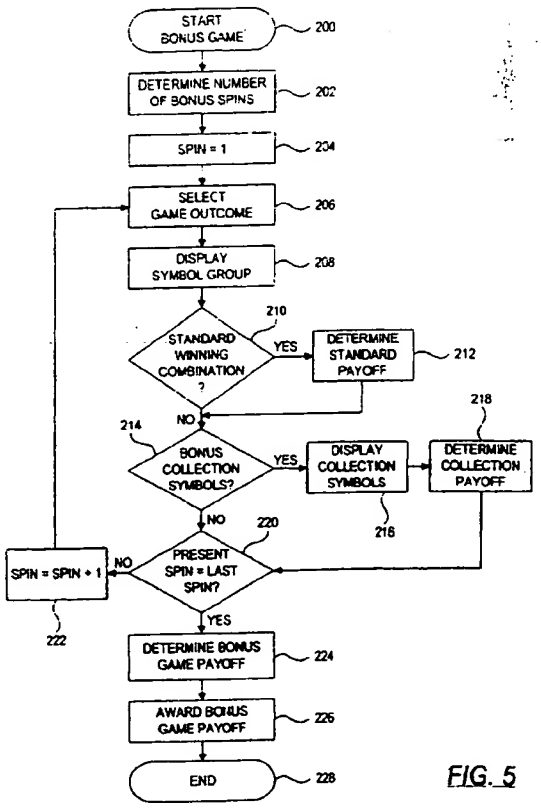

FIG. 5

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 40 2172

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Y	* column 3, line 29 - column 4, line 23 *	1,3,5,6, 10	
A	* column 6, line 41 - column 7, line 2 * * claims 1-4; figure 1 *	8,9	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	3 August 2001	Reule, D

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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EPODOC ID: EP 0984409A3 1 >

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 40 2172

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